A rolling stand for hot or cold rolling of bar steel or wire rod stock comprises first and second rolls which define a nip therebetween. The first and second rolls have surface portions which engage the stock and reduce its cross section as the stock advances therebetween. The first and second rolls also have drive-transmitting surface portions which engage each other and which are spaced axially from the stock-engaging surface portions. A means is provided for establishing a drive-transmitting relationship between the drive-transmitting surface portions of the rolls so that the second roll is driven from the first roll by the drive-transmitting surface portions.

9 Claims, 3 Drawing Figures
TWO-HIGH ROLLING STAND

BACKGROUND OF THE INVENTION

The present invention relates to a rolling stand, and particularly to a rolling stand for hot or cold rolling of bar steel or wire rod stock.

Conventionally, rolling stands for hot or cold rolling of bar steel or wire rod stock comprises a pair of rolls which have surface portions which engage the stock to reduce the cross section of the stock as the stock advances therebetweeen. As the stock advances between the rolls, the stock tends to cause the rolls to spread or separate. Such conventional rolling stands have provision for applying a force to the rolls to prevent such rolls from separating and to effect the desired stock cross section reduction.

In the past, such rolling stands have utilized separate drives for each roll. Commonly, each roll is driven through a universal joint by either external gearing or by separate directly coupled motors. Such driving of each roll separately requires a large machine investment and requires a substantial amount of space in the mill area.

There are known equipment constructions having a pair of rolls which define a nip therebetween through which stock is advanced. In such known constructions, only one of the rolls is driven, the other roll being driven by the engagement with the stock during advancement of the stock between the rolls. However, there is no known rolling stand in which only one of the rolls is driven. In all known rolling stands, there have been separate drives utilized for each roll, as noted hereinabove.

SUMMARY OF THE PRESENT INVENTION

The present invention is directed to a rolling stand and method of rolling in which separate drives, as noted above, are eliminated. This, of course, reduces the investment cost with respect to the construction of the stand and also minimizes space requirements.

The present invention specifically provides a rolling stand having a pair of stock-shaping rolls where only one of the rolls of the rolling stand is driven by an input drive, the other roll being driven through torque-transmitting drive surfaces of the rolls. More specifically, each of the rolls has a drive-transmitting surface which is engageable with a drive-transmitting surface on the other roll. While one of the rolls is driven, the other roll is driven from or due to the engagement of the drive-transmitting surfaces.

In accordance with the present invention, a drive-transmitting relationship is established between the surface portions of the rolls by a suitable means which urges the rolls together with a force in excess of the force necessary to effect the rolling of the stock, and sufficiently in excess to provide the drive. This means which applies the force to the drive-transmitting surfaces of the rolls is such that the force may be removed when rolling is not being effected so as to relieve the pressure forces on the surfaces of the rolls, thereby providing for a long life for the rolls. The means, specifically as disclosed in the present application, for applying the force to the rolls is a hydraulic means which may be controlled to control the pressure and to rapidly effect a release of that pressure.

DESCRIPTION OF THE DRAWINGS

Further features and advantages of the present invention will be apparent to those skilled in the art to which it relates from the following detailed description of a preferred embodiment thereof made with reference to the accompanying drawings showing one of the embodiments of the invention and in which:

FIG. 1 is a schematic front view of a rolling stand embodying the present invention;

FIG. 2 is a sectional view taken approximately along the line II—II in FIG. 1; and

FIG. 3 shows an enlarged view of an improved groove shape which may be applied to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention, as noted above, provides an improved and unique roll stand. The present invention is applicable to a variety of roll stand constructions, and as representative is illustrated in the drawings as applied to a roll stand A. The roll stand A is a two-high roll stand and comprises two pairs of roller bearing housings 1. The roll stand also includes a pair of rolls 2 and 3. The rolls 2, 3 have shaft portions which project axially therefrom and are received in roller bearings (not shown) which are supported in the roller bearing housings 1.

The rolls 2, 3 define a nip therebetween and bar stock 7, which is advanced between the rolls, is shaped as it moves through the nip. In fact, the rolls have surface portions 2a and 3a which define a groove through which the stock moves. The surface portions 2a, 3a, engage the stock as it advances between the rolls and effect a reduction in the cross section of the stock as it advances therebetween.

The roll 3 is positively driven by a suitable external drive which is generally designated by the reference numeral 8. The drive 8 may be of any suitable form, such as either gearing or an independent motor, and the reference numeral 8 represents the drive shaft for driving the roll 3. It should be apparent from the drawings that there is no external drive, such as an independent motor or gearing, for driving the roll 2. In accordance with the present invention, the roll 2 is driven from the roll 3 due to frictional engagement between drive-transmitting surface portions on the rolls 2, 3.

More specifically, the roll 2 is driven due to the fact that the surface portions 6 thereof are in a drive-transmitting relationship with corresponding surface portions 6 on the roll 3. The surface portions 6, when stock is being rolled, are in a sufficient pressure relationship to effect the transmission of torque therebetweeen so that the roll 22 is positively driven at the surface speed of the roll 3 through those surface portions.

Suitable means is provided in the rolling stand A for effecting the drive-transmitting relationship between the surface portions 6 of the rolls. That means, as disclosed in FIG. 2, is designated B. The means B for establishing the drive-transmitting pressure relationship specifically includes a pair of screw rods 4 which extend slidably through passageways in the roller bearing housings 1. The lower roller bearing housing 1, as illustrated in FIG. 3, has recesses 1a therein for receiving the head end of the rods 4. The upper roller bearing
housing 1 has chamber portions therein through which the rods 4 extend and which chamber portions are divided into two chambers by piston members 5. The two chambers are designated 11 and 12 in FIG. 2.

The chambers 11 and 12 are suitably connected to a hydraulic system for receiving hydraulic fluid from that system. It should be apparent that, when there is an equal fluid pressure in the chambers 11 and 12, the only force applied between the rolls 2 and 3 is that due to the weight of the roll 2 and the bearing. If a higher pressure is applied in the chamber portion 11 than in chamber 12, there is an upward force acting on the upper roller bearing housing 1, tending to cause the roller bearing housing 1 to raise. This, of course, causes a reduction in the force applied through the surface portions 6 of the rolls 2 and 3. In fact, the pressure in chamber 11 can be relatively high enough so as to eliminate all forces applied between the rolls 2, 3, and specifically, between the surface portions 6 thereof. Moreover, when the roll stand is not in operation, the rolls can be moved completely apart to provide a gap between the surface portions 6.

It should also be apparent from the above that in the event the pressure in chamber portion 12 exceeds that in chamber portion 11, the roller bearing housings 1 are forced together. When the roller bearing housings 1 are forced together, the roll surface portions 6 come into contact and depending upon the relative pressures in the chamber portions 11, 12, the force urging the rolls together is controlled. Accordingly, the relative pressures in chamber portions 11, 12 control the force with which the rolls are engaged. That force, of course, is controlled so as to provide a sufficient force urging the rolls together to overcome the force of the stock tending to separate the rolls and also sufficient to provide the drive-transmitting relationship between the surface portions 6 of the rolls 2 and 3, so that the roll 2 is driven solely by that pressure relationship between the surface portions 6 of the rolls 2 and 3.

The drawings illustrate the mechanisms B for applying the force and releasing the force on the right side of the rolls 2, 3, but it should be clear that a similar mechanism is applied to and associated with the roller bearing housings 1 on the left side of the rolls, so that in all there are four screw rods 4 and four sets of hydraulic chambers 11, 12 for controlling the pressure applied to the rolls 2 and 3.

From the above, it should be apparent that applicants have provided a highly improved roll stand which is extremely simple in construction, since it requires only one drive into the roll stand for driving one of the rolls and that the second roll is driven by a drive-transmitting surface engagement with the driven roll. Also, the pressure relationship between the drive-transmitting surfaces of the rolls can be controlled by hydraulics, and when the roll stand is idle, the rolls can be completely separated in order to eliminate any force being applied between the surfaces of the rolls. This, of course, forms a gap between the drive-transmitting surface portions 6, which is of great advantage as it allows for possible removal of finished stock which may be between the rolls.

Illustrated in FIG. 3 is a specific roll construction capable of use in the roll stand embodying the present invention. As illustrated in FIG. 3, the rolls define a groove 9 which is provided with an extra gap which extends axially outwardly of the groove 9 in opposite directions, that gap being designated 10 in the drawings. The drive-transmitting portions between the rolls are designated 8 in FIG. 3. The gap 10 prevents or minimizes the possibility of slag or scales formed by reduction or rolling of the stock in the groove 9 to be urged between the drive-transmitting portions 8. In other words, the groove 10 provides an area that may receive the slag or scales rather than the slag or scales tending to separate the rolls, as would be the case if the slag or scales tended to creep into or between the drive-transmitting surface portions 8.

Having described our invention, we claim:

1. A rolling stand for hot or cold rolling of bar steel or wire rod stock comprising means for reducing a dimension of the rod stock comprising first and second rolls which define a nip therebetween, said first and second rolls having surface portions which engage the stock and reduce its cross section as the stock advances therebetween, said first and second rolls having further surface portions which engage each other and which are spaced axially from the stock-engaging surface portions, drive means for driving one of said rolls, means for applying a pressure force between said further surface portions for establishing a torque-transmitting relationship between said further surface portions to drive said second roll from said first roll due to said torque-transmitting relationship while the rod stock is advanced between the rolls and reduced thereby in dimension, means for controlling the magnitude of said pressure force, said pressure force controlling means reducing the pressure force when there is not stock between the rolls and thereby reducing the possibility of excessive wear or cracking of the rolls.

2. A rolling stand as defined in claim 1 wherein each of said rolls have shaft portions projecting from the opposite ends thereof, roller bearing housings associated with each shaft portion and receiving each of said shaft portions, and said means for establishing a torque-transmitting relationship between said further surface portions comprises means associated with said roller bearing housings for urging said housings together.

3. A rolling stand as defined in claim 2 wherein said means for establishing said torque-transmitting relationship comprises rod means which extends through passages in said roller bearing housings and which is slidably received in said passages, and hydraulic means associated with said rod means, said hydraulic means including first and second chamber portions and an increase in pressure in said first chamber portion relative to the pressure in said second chamber portion effecting movement of said roller bearing housings apart to thereby move said rolls apart and an increase in pressure in said second chamber portion relative to the pressure in said first chamber portion urging said rolls together and increasing the pressure relationship between said torque-transmitting surfaces of the rolls.

4. A rolling stand as defined in claim 1 wherein said first and second rolls have surface portions which engage the stock to reduce the cross section of the stock and intermediate those surface portions and the torque-transmitting surface portions have surface portions which define a slag-receiving groove.

5. A rolling stand for hot or cold rolling of bar steel or wire rod stock comprising means for reducing a dimension of the rod stock comprising first and second rolls which define a nip therebetween, said first and second rolls having surface portions which engage the
stock and reduce its cross section as the stock advances therebetween, first drive means drivingly connected with said first roll to effect rotation thereof, and second drive means for driving said second roll, said second drive means solely comprising drive-transmitting surface portions of said first and second rolls which have a drive-transmitting pressure relationship during rolling of the stock, means for establishing said drive-transmitting pressure relationship comprising means for applying a pressure force urging said drive-transmitting surface portions into contact while the rod stock is advanced between the rolls and reduced thereby in dimension, means for controlling the magnitude of said pressure force, said pressure force controlling means reducing the pressure force when there is no stock between the rolls and thereby reducing the possibility of excessive wear and cracking of the rolls.

6. A rolling stand as defined in claim 5 wherein each of said rolls has shaft portions projecting from the opposite ends thereof, roller bearing housings associated with each shaft portion and receiving each of said shaft portions, and said means for establishing a torque-transmitting relationship between said further surface portions comprising means associated with said roller bearing housings for urging said housings together.

7. A rolling stand as defined in claim 6 wherein said means for establishing said torque-transmitting relationship comprises rod means which extends through passages in said roller bearing housings and which is slidably received in said passages, and hydraulic means associated with said rod means, said hydraulic means including first and second chamber portions, said first chamber portion on an increase in pressure therein relative to the pressure in said second chamber portion effecting movement of said roller bearing housing apart to thereby move said rollers apart and said second chamber portion upon a pressure increase relative to the pressure in said first chamber portion therein urging said rollers together to increase the pressure relationship between said torque-transmitting surfaces of the rollers.

8. A method of rolling bar steel or wire rod stock comprising the steps of providing first and second rolls which define a nip therebetween, advancing stock between surface portions of the rolls to reduce the cross section of the stock, positively driving one of said rolls from an external source, driving the other of said rolls due to surface pressure engagement between said rolls establishing said torque-transmitting pressure relationship between said rolls to drive the second roll from the first roll due only to said torque-transmitting relationship while the rod stock is being advanced through the rolls, and reducing said torque-transmitting pressure when there is no stock between the rolls.

9. A method of rolling as defined in claim 8 further including the step of varying the pressure relationship between the rolls for different rolling operations, and removing the pressure relationship entirely and moving one of said rolls relative to the other of the rolls when the rolling operation is completed.

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